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E. Barbosa
Inter American University of Puerto Rico

G. W. Laguna
Lawrence Livermore National Laboratory

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Elizabeth Barbosa[1]
Inter American University of Puerto Rico, Bayamon, PR, 00957

Gary Laguna[2]
Environmental Restoration Department, Lawrence Livermore National Laboratory, Livermore, CA, 97550

[1] Computer Scientist, Environmental Restoration Department, LLNL, Inter American University of Puerto Rico
[2] Computer Scientist, *mentor* Environmental Restoration Department, Lawrence Livermore National Laboratory, CA
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Abstract

A common approach to software development has been to create a single module to handle every function required for the software, including input, processing and user interface. For Web-based applications this approach has the drawback of intertwining code that generates web pages with code that does processing. The result is that small changes to one may have unintended consequences in the other. A better approach to software development for web-based applications would reduce side effects by separating code into separate modules by function, limiting communication between modules to defined interfaces. This summer as a secondary project for my 2012 internship at Lawrence Livermore National Laboratory I was assigned the task of modularizing the functionality of one TEIMS web-based application using the Model View Controller paradigm. TEIMS is an enterprise system comprised of a collection of web-based applications and database backend that supports data collection, reporting and, scientific findings for ERD.

Model View Controller is a design pattern used in service architectures. MVC separates a software architecture into three distinct elements: model, view and, controller. The pre-existing architecture of the TEIMS tool had a separate model component and a combined view/controller module. The first step towards MVC was to remove embedded software code used to generate web pages. I then created the view module using an HTML templating system. Lastly I modified the remaining controller code to utilize the interface to the templating system. The result is a simpler and easier to maintain TEIMS application.

Nomenclature

MVC = *Model View Controller*

TEIMS = *Taurus Environmental Information Management System*

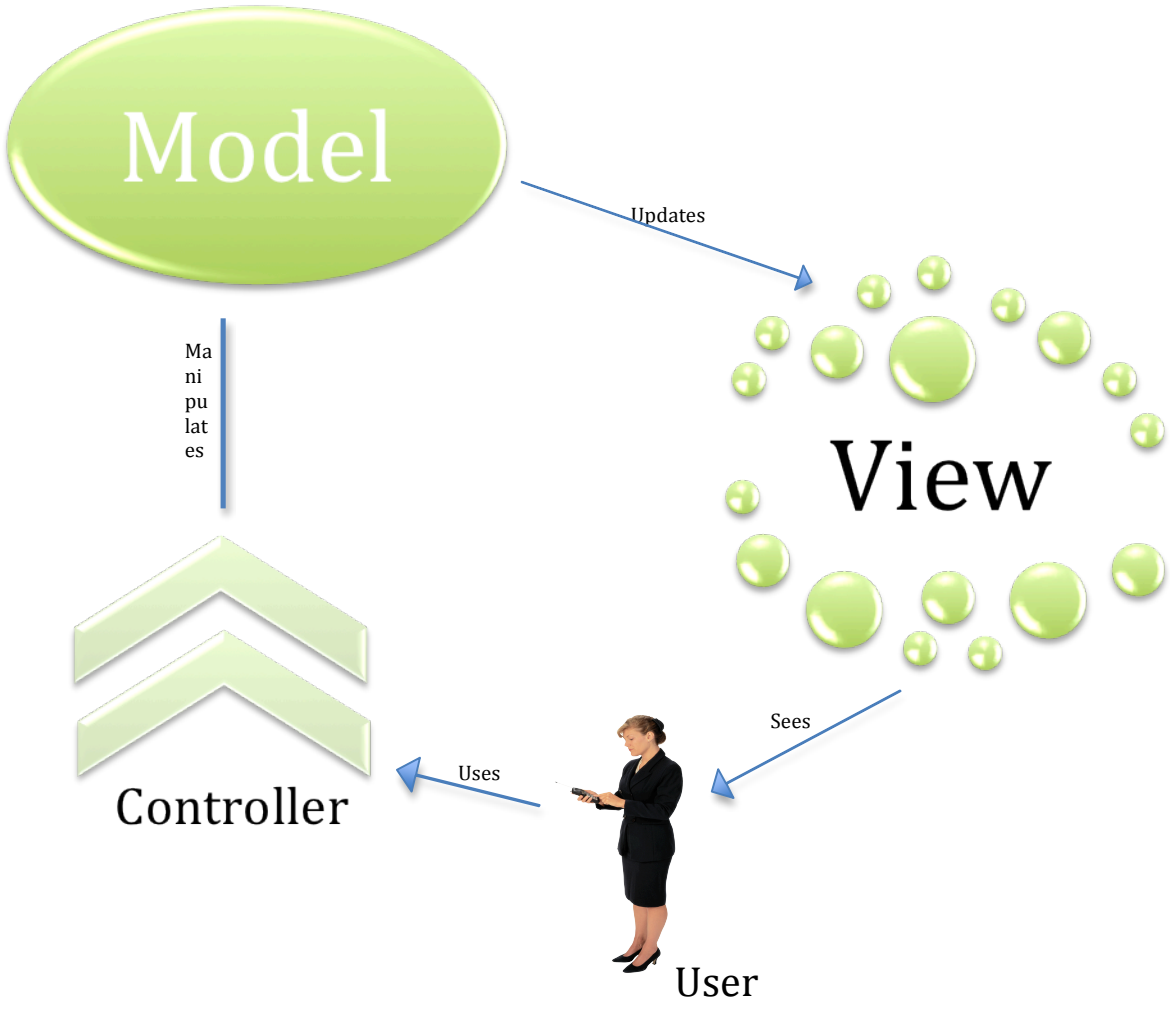
ERD = *Environmental Restoration Department*

I. Introduction

World War II era operations (1940s) at the U.S. Navy NAS Livermore, contributed to environmental contamination at the LLNL site. LLNL was established in 1952 as a national defense research and development laboratory. Since the discovery of such contamination in 1983, LLNL has actively pursued environmental restoration. The TEIMS system has evolved to facilitate these efforts, starting with predecessor applications developed in the 1980's.

II. Model View Controller

The *Model* is the way the underlying data is structured based on business rules. The *View* is what will be presented to the user, which can be any output representation of data such as a plot, diagram or data tables. The *View* will request or receive information from the model that it needs to generate what the user will see. The *Controller* is a mediator of user input and serves as the processing element. Separating these three elements allows each module to be smaller, easier to understand and easier to change. This paradigm also allows for the *Controller* to work with different *Model* and *View* components.



III. Re-Architecting TEIMS

The first step in the process of re-architecting this TEIMS application was to remove all embedded code that generated markup for the web page. Then I redesigned the existing code, transforming this module into the *Controller*. This also allowed me to reuse the existing interface between the *Controller* and *Model*. The HTML generating code removed from the initial application was then used to guide the development of the *View*, using Perl's HTML/Template module. The separation of the View from the rest of the code

allowed the easy incorporation of other presentation improvements, giving this application an improved look and feel.

IV. Conclusion

The implementation of the Model View Controller paradigm in TEIMS is an organizational structure that better supports ease of modification and maintenance. The result is a flexible, manageable, reusable, sleek design and look for this TEIMS application.

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References

Scott Walters Perl (August 12, 2012) Design Patterns Tiny Wiki – Model View Controller Retrieved June 22, 2012 from http://www.perldesignpatterns.com/?ModelViewController

The Perl Programming Language Retrieved June 25, 2012 from http://www.perl.org/docs.html http://perldoc.perl.org/

Perl Modules, what are they and why do I care? Retrieved June 27, 2012 from http://learn.perl.org/modules/

Sam Tregar, HTML-Template-2.6, Copyright (C) 2000-2002 Retrieved June 27, 2012 from

http://search.cpan.org/~samtregar/HTML-Template-2.6/Template.pm

Jeffa, The Motivation, Mar 20, 2001 - HTML Template Tutorial Retrieved June 28, 2012 from

http://www.perlmonks.org/?node_id=65642